

Appendix F

WAG 6 and 10 Ecological Risk Assessment

This Appendix does not discuss the results of the OU 10-04 INEEL-wide ERA. However, any COPC retained for further evaluation in the WAG 6 and 10 Ecological Risk Assessment (ERA) was retained for evaluation in the OU 10-04 INEEL-wide ERA.

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Appendix F

Ecological Risk Assessment Methodologies

The Waste Area Groups (WAGs) 6 and 10 Ecological Risk Assessment (ERA) will assess risks to ecological receptors using an approach that parallels the human health risk assessment approach. This information is then used in the third phase, the Operable Unit (OU) 10-04 ERA (see Appendix H). The OU 10-04 ERA is performed to integrate potential risks identified during the WAG ERAs to evaluate potential cumulative risks to the Idaho National Engineering and Environmental Laboratory (INEEL) ecosystem.

The WAGs 6 and 10 ERA will evaluate the potential risks of adverse ecological effects as a result of contamination. The primary goals of the ERA are as follows:

- Define the extent of contamination with respect to ecological receptors for each site
- Determine the actual or potential effects from contaminants on protected wildlife species, habitats, or special environments at the site
- Identify sites and contaminants of potential concern (COPCs) to be assessed at the OU 10-04 ERA
- Provide input to the data gap analysis for the OU 10-04 ERA

The WAG ERA will follow the guidance presented in the Environmental Protection Agency's (EPA's) framework for an ERA (EPA 1992a). The guidance applies a three-step approach including problem formulation, analysis, and risk characterization. In addition, aspects of the methodology developed for conducting assessments at the INEEL (VanHorn et al. 1995) will be incorporated into the assessment.

The WAG ERA approach emphasizes coordinating analysis of data and contaminant transport calculations produced during the human health portion of the Baseline Risk Assessment.

F-1. WAG 6 AND 10 ECOLOGICAL RISK ASSESSMENT

The ecological risk assessment for WAGs 6 and 10 represents the second phase of the INEEL ERA process detailed on Figure F-1. The ERA results provide a site-by-site evaluation of the potential risks to INEEL ecological resources as a result of exposure to radiological and nonradiological contaminants at the WAG level.

An ecological site screening, which is a preassessment or data-gap analysis performed at the WAG level, is performed as the first phase in the ERA process. The screening reduces the number of sites and contaminants addressed in subsequent assessments. Screening is used only as a preassessment tool to (a) better define the extent and nature of individual WAG sites of contamination and identify sites where no COPCs are found, (b) reduce the number of COPCs addressed in the WAG ERA by eliminating those that clearly pose a low likelihood for risk, (c) identify sites for which further data must be collected, and (d) identify other data gaps. The screening also supports problem formulation and the determination of the media and pathways to be evaluated for WAG ERA assessments. The results of the WAGs 6 and 10 screening and data gaps analysis are reported in the OU 10-04 Remedial Investigation/Feasibility Study (RI/FS) Work Plan (DOE-ID 1999).

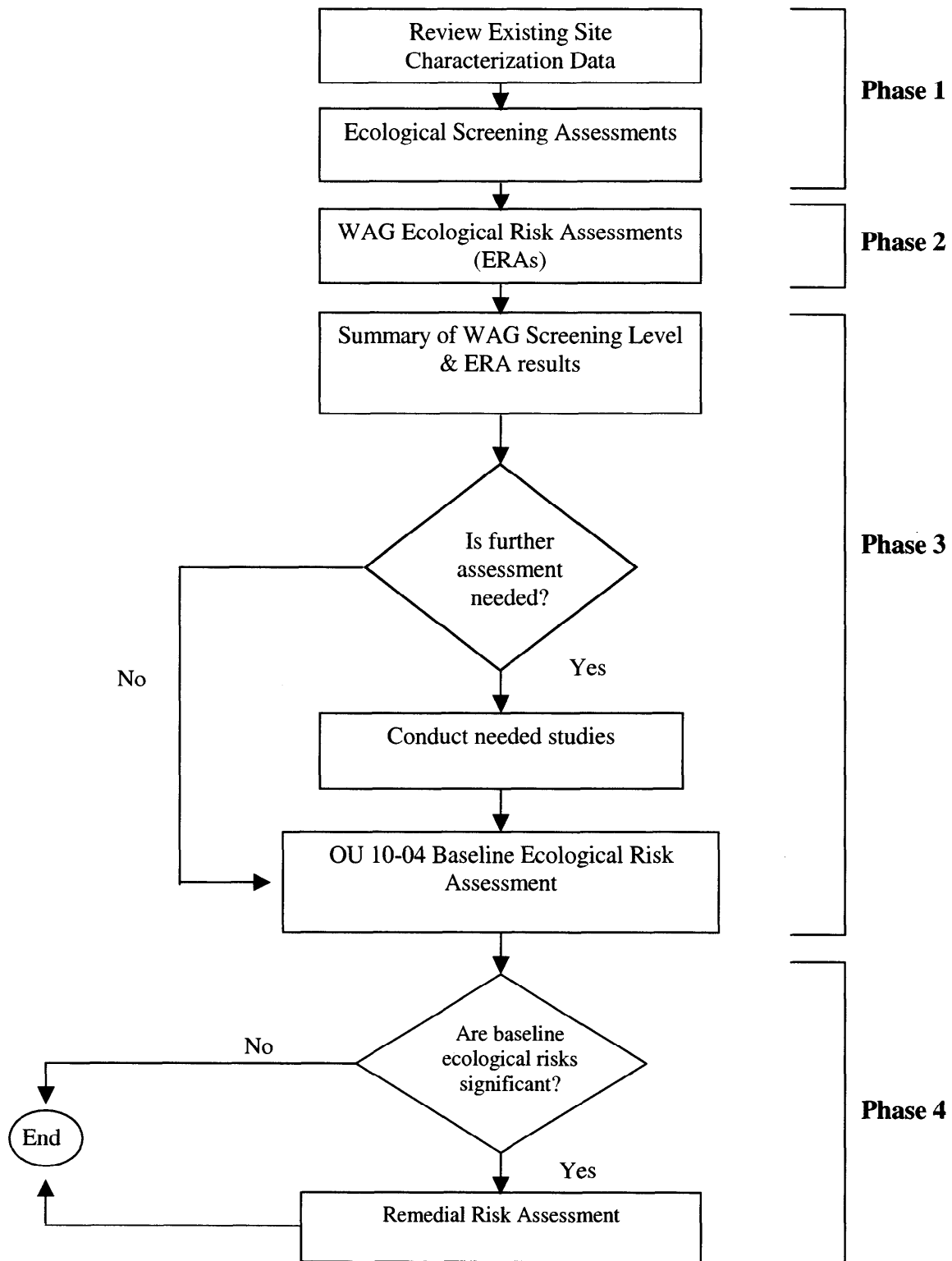


Figure F-1. Four-phased approach to the INEEL ecological risk assessment.

The ERA is the second phase in the INEEL ERA process and provides a site-by-site evaluation of the risks to ecological resources as a result of exposure to radiological and nonradiological contaminants at the WAG level. The assessment was performed using the same basic methodology developed in the *Guidance Manual for Conducting Screening-level Ecological Risk Assessments at the INEL* (VanHorn et al. 1995). The ERA incorporates a preliminary COPC screening step to eliminate COPCs for which concentrations do not exceed INEEL background and site specific ecologically based screening levels (EBSLs). The purpose of this step is to further refine sites and contaminants identified in the first phase screening. The resulting sites and contaminants, in addition to those sites for which inadequate sampling information is available, were analyzed in the WAG ERA. The results of the WAGs 6 and 10 ERA will be integrated with similar assessments for other INEEL WAGs to support the performance of the OU 10-04 RI/FS (Phase 3). The fourth phase of the process includes the Record of Decision and Remedial Decision/Remedial Action processes under OU 10-04. The four-phased ERA process is discussed in further detail in Section F-4.

F-2. OBJECTIVES

The WAGs 6 and 10 ERA is performed to achieve the following objectives:

- To determine the potential for adverse effects from site-related contaminants on ecological receptors, including protected wildlife species at the WAG level
- To identify sites and COPCs to be assessed in the INEEL-wide ERA
- To provide input to the data gap analysis for the INEEL-wide ERA.

The INEEL approach for ERAs was specifically designed to follow the direction provided by the EPA *Framework for Ecological Risk Assessment* (EPA 1992b) and more recent EPA guidelines (EPA 1996). The EPA approach divides the ERA process into three steps: problem formulation, analysis, and risk characterization.

The goal of the problem formulation step is to investigate the interactions between the stressor characteristics, the ecosystem potentially at risk, and the ecological effects (EPA 1992b). The contaminants, the definition of assessment and measurement endpoints, and the ecological effects will be used to analyze risk using the conceptual site model (CSM). This step of the assessment is presented in Section F-3.5.

In the analysis step, the likelihood and significance of an adverse reaction from exposure to stressors were evaluated. The exposure assessment involves relating contaminant migration to exposure pathways for ecological receptors. The behavior and fate of the COPCs in the terrestrial environment were presented in a general manner, because no formal fate and transport modeling was conducted for the WAG ERA. The ecological effects assessment consisted of a hazard evaluation and a dose-response assessment. The hazard evaluation involved a comprehensive review of toxicity data for contaminants to identify the nature and severity of toxic properties. The dose from multiple media (surface and subsurface soil and surface water) identified at the INEEL was developed and used to assess the potential risk to receptors. Because no dose-based toxicological criteria exist for ecological receptors, it was necessary to develop appropriate toxicity reference values (TRVs) for the contaminants and species at the INEEL. A quantitative analysis was used, augmented by qualitative information and professional judgment as necessary.

The risk-characterization step has two primary elements (EPA 1992b, 1996). The first element is the development of an indication of the likelihood of adverse effects to ecological receptors. The second

element is the presentation of the assessment results in a form that serves as input to the risk management process. To determine whether any risk is indicated from the contaminant concentrations, exposure parameters were used to calculate the exposure dose for key individual species, including threatened or endangered (T/E) species and other “species of concern” (Section F-3.7.2). Hazard quotients (HQs) were then calculated for WAGs 6 and 10 receptors by dividing the calculated dose by the TRVs. The HQs then were used as indicators of the potential for adverse effects. The risk characterization section of the WAGs 6 and 10 ERA is presented in Section F-3.9.

F-3. PROBLEM FORMULATION

The goal of the problem-formulation step of the ERA is to investigate the interactions between the stressor characteristics, the ecosystem potentially at risk, and the ecological effects (EPA 1992b). The problem-formulation process begins with a general description of the sites and previous investigations and a characterization of the ecosystem at risk. Next, the potential stressors to the ecosystem are identified, the migration pathways of the identified stressors are modeled, and the potentially affected components of the ecosystem are identified. The ecosystem at risk and the identified stressors with exposure pathways are then integrated to develop the CSM. The problem-formulation step results in the characterization of stressors (i.e., the identification of the COPCs), the definition of the assessment endpoints, and pathway and exposure models that are used to analyze risk using the CSM. The primary elements of the problem-formulation step for the WAG ERA are described in the following sections.

F-3.1 Overview of WAGs 6 and 10

WAG 6 includes the Experimental Breeder Reactor I (EBR-I) and Boiling Water Reactor Experiment (BORAX) areas. The EBR-I and BORAX sites consist primarily of old aboveground and belowground tanks, but also include spill areas and solid waste disposal areas. The WAG 6 boundary encompasses the EBR-I and BORAX facilities and immediately adjacent areas including all surface and subsurface areas.

WAG 10 includes miscellaneous surface sites and liquid disposal areas throughout the INEEL outside other WAGs. WAG 10 also includes regional Snake River Plain Aquifer concerns related to the INEEL that are unaddressable on a WAG-specific basis. The WAG 10 boundary is the INEEL boundary or beyond, as necessary, to encompass any real or potential impact from the INEEL activities and any areas within the INEEL not covered by other WAGs.

Information gathered during the WAGs 6 and 10 RI/FS, along with documents from previous WAGs 6 and 10 investigations (including Track 1, Track 2, Interim Action, and remedial investigation documents), were used to guide the comprehensive RI/FS. Also during the comprehensive WAGs 6 and 10 investigation, unevaluated sites were cumulatively and comprehensively investigated to assess the overall risk posed by WAGs 6 and 10.

F-3.2 Sites of Concern

Sites identified in the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) initially were eliminated from further evaluation in the WAGs 6 and 10 ERA data gap analysis based on (a) whether the site was uncontaminated (the site contained no contamination source to the environment) or (b) no pathway from the contaminants to ecological receptors existed. All sites at WAGs 6 and 10 were reviewed in the initial ecological site screening and data-gap identification in the OU 10-04 Workplan (DOE-ID 1999, Appendix C) for elimination from evaluation in the ERA.

F-3.2.1 Species selected as endpoint

In order to simplify the ERA, while incorporating large amounts of data, specific ecological entities have been identified as receptors, rather than listing functional groups to which the receptor belongs as was previously done in the WAG level ERAs. In some cases, multiple functional groups are represented by a single receptor. The abundance and distribution of a species was considered in the selection of receptors. Rare receptors (e.g., gray wolf and black tern) and occasional or uncommon receptors (e.g., long-eared owl, bobcat, or barn swallow) were not selected because they are not primary components in the INEEL food web. Every attempt was made to include all functional groups; however, professional judgement also played a factor in receptor selection. A single species was sometimes chosen to represent several functional groups. The availability of pertinent toxicity data, exposure parameters, and site-specific data were key factors in the selection of primary receptors. Table F-1 provides the applicable endpoints associated with the particular receptor. This process allows for an easier method of quantifying risks to multiple receptors and pathways over a very large spatial area. A complete listing of the WAG ERA functional groups and species represented by those groups is located in the OU 10-04 Workplan (DOE-ID 1999).

No amphibians are known to be present, and no surface hydrology exists to support fish or other aquatic species. Therefore, aquatic species were not evaluated in the assessment.

Terrestrial invertebrates and microorganisms that are present at WAGs 6 and 10 sites are important links in dietary exposure for wildlife and also may function as good indicators for contaminant exposure in soil and vegetation uptake. Microorganisms also play an important role in ecosystem processes. However, a list of terrestrial invertebrates potentially present in and surrounding WAGs 6 and 10 are not available and these ecosystem components were not quantitatively assessed in the WAGs 6 and 10 ERA.

The varying behaviors of the wildlife species potentially present at WAGs 6 and 10 sites include, but are not limited to, grazing and browsing on vegetation, burrowing and flying, and preying on insects and small mammals. The complexity of the behaviors is significant when considering the fate and transport of contaminants and the possibility of exposure to contaminants. For example, subsurface contamination can become surface contamination when translocated by burrowing animals or can be introduced into the food web when plants take up contamination and are then ingested by a herbivore. If prey, such as a small mammal, becomes contaminated by ingesting contaminated soil or vegetation and is then captured by a predator, such as a ferruginous hawk, the contamination can be taken offsite when the hawk returns to its nest to feed nestlings. Scenarios for potential exposure of fauna to WAGs 6 and 10 contaminants are discussed Section F-3.6. Though some population studies have been conducted for cyclic rabbit and rodent populations, raptors, and several game species (e.g., pronghorn antelope and sage grouse), no recent comprehensive studies have been conducted to assess either WAG-specific or INEEL-wide wildlife population status and trends are associated with contaminant effects.

The flora and fauna present in and around WAG 6 and 10 sites have been combined into a simplified food web model shown in Figure F-2. The variability in environmental conditions such as population sizes or seasons was not considered in the model, and a constant environment was assumed. Terrestrial species, including decomposers, producers (e.g., vegetation), primary consumers or herbivores (e.g., rodents), secondary consumers or carnivores (e.g., snakes), and tertiary or top carnivores (e.g., raptors) were incorporated into the CSM (Figure F-3). The dietary relationships between each level of species were simplified to assess direct and indirect exposure to contaminants as discussed later in this section.

Table F-1. Summary of assessment endpoints, receptors, and measures.

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
1.	Plants	COPC concentrations in soil and plant tissues.	HQ and hazard indices (HIs) for COPCs in direct contact with plants; qualitative discussion for COPCs lacking toxicity data; qualitative and quantitative vegetation surveys and transects	Biomass, diversity, and percent cover information, and long-term vegetation mapping are also available
2.	Beetles, grasshoppers	COPC concentrations in soil	HQ and HIs for COPCs in direct contact with soil fauna; qualitative discussion for COPCs lacking toxicity data	Compilation of INEEL soil types
3.	All terrestrial receptors as listed below^a:	COPC concentrations in soil, surface water, sediment, plant and small mammal tissue; modeled COPC concentrations in upper trophic level receptors as appropriate	<ul style="list-style-type: none"> • HQ and HIs for COPCs for soil, surface water, and dietary ingestion • HQs and HIs for COPC exposure via inhalation of fugitive dust and dermal exposure • Qualitative discussion for COPCs lacking toxicity data • Qualitative discussion for receptors lacking exposure parameters 	<ul style="list-style-type: none"> • T/E surveys • INEEL topography • Abundance and distribution of suitable forage areas • Abundance and distribution of suitable nesting or breeding locations and areas • Abundance and distribution of prey species • Abundance and distribution of suitable habitat
	Mule deer	" "	As above for mule deer	As in 3, above, including Idaho Fish & Game (ID F&G) game tag data
	Pygmy rabbit	" "	As above for pygmy rabbit	As in 3, above, including Environmental Science and Research Foundation (ESRF) rabbit survey data from 1980 to 1999, which provides relative abundance information

Table F-1. (continued).

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
3. continued	Deer mouse	" "	As above for deer mouse	As in 3, above
	Coyote	" "	As above for coyote	As in 3, above
	Townsend's western big-eared bat	" "	As above for Townsend's western big-eared bat	As in 3, above
	Mourning dove	" "	As above for mourning dove	As in 3, above, including ESRF Breeding Bird Survey (BBS) data; BBS includes changes over multiple years, species richness and data pertinent to distribution and populations
	Sage sparrow	" "	As above for sage sparrow	As in 3, above, including ESRF BBS data
	Ferruginous hawk	" "	As above for ferruginous hawk	As in 3, above, including ESRF BBS data
	Loggerhead shrike	" "	As above for loggerhead shrike	As in 3, above, including ESRF BBS data
	Burrowing owl	COPC concentrations in soil, surface water, sediment, plant and small mammal tissue; modeled COPC concentrations in upper trophic level receptors as appropriate	As above for burrowing owl	As in 3, above, including ESRF BBS data
	Black-billed magpie	" "	As above for black-billed magpie	As in 3, above, including ESRF BBS data
	Great Basin spadefoot toad	COPC concentrations in soil, surface water and sediment	Qualitative evaluation	As in 3, above
	Sagebrush lizard	COPC concentrations in soil	HQs and HIs (if possible) as above for sagebrush lizard depending on availability of TRVs and exposure parameters	As in 3, above

Table F-1. (continued).

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
4.	Blue-winged teal	COPC concentrations in surface water and sediment	<ul style="list-style-type: none"> HQs and HIs for blue-winged teal for sediment, surface water, and dietary ingestion depending on availability of dietary items for evaluation HQs and HIs for COPC exposure via dermal exposure to organic compounds Qualitative discussion for COPCs lacking toxicity data Qualitative discussion for receptors lacking exposure parameters 	As in 3, above, including ESRF BBS data
5.	Various receptors as shown below^a:	COPC concentrations in soil, surface water, sediment, and plant tissue; modeled COPC concentrations in upper trophic level receptors as appropriate	<p>HQ and HIs for COPCs for soil, surface water, and dietary ingestion</p> <p>HQs and HIs for COPC exposure via inhalation of fugitive dust and dermal exposure</p> <p>Qualitative discussion for COPCs lacking toxicity data</p> <p>Qualitative discussion for receptors lacking exposure parameters</p>	As in 3, above, including ID F&G game tag data.
	Mule deer	" "	<p>Qualitative discussion for receptors lacking exposure parameters</p> <p>HQs and HIs as in 5., above, for mule deer</p>	As in 3, above, including ID F&G game tag data
	Blue-winged teal — waterfowl, shorebirds	COPC concentrations in surface water and sediment	HQs and HIs as in 5., above, for blue-winged teal	As in 3, above, including ID F&G game tag data
	Mourning dove	COPC concentrations in soil, surface water and plant tissue; modeled COPC concentrations in upper trophic level receptors	HQs and HIs as in 5., above, for mourning dove	As in 3, above, including ID F&G game tag data

Table F-1. (continued).

Assessment Endpoint	Receptor	Measures of Exposure	Measures of Effects	Measures of Receptor and Ecosystem Characteristics/Additional Lines of Evidence
6.	Pygmy rabbit	COPC concentrations in soil, surface water and plant tissue; modeled COPC concentrations in upper trophic level receptors	HQs and HIs as in 5., above, for pygmy rabbit	As in 3, above, including ID F&G game tag data, and ESRF rabbit counts
	Nuttall's cottontail, montane vole, horned lark, beetles, grasshoppers	COPC concentrations in soil, surface water, beetles, grasshoppers, and plant tissue; modeled COPC concentrations in upper trophic level receptors	HQs and HIs as in 5., above, for listed receptors	T/E surveys, BBS INEEL topography Abundance and distribution of suitable forage areas and prey species Abundance and distribution of suitable nesting or breeding locations and areas Abundance and distribution of suitable habitat
a. Species with a potential presence at WAGs 6 and 10.				

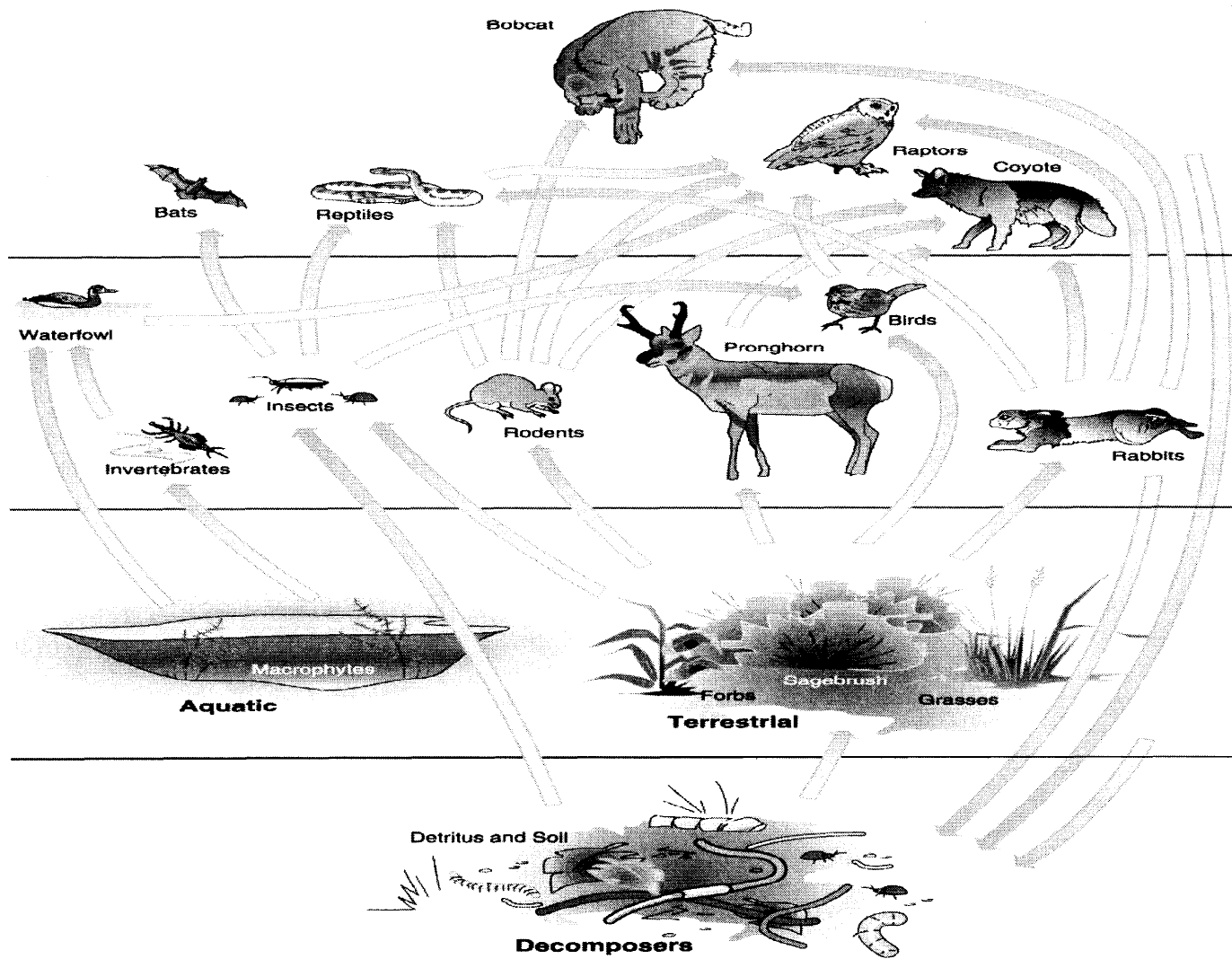


Figure F-2. Simplified INEEL food web.

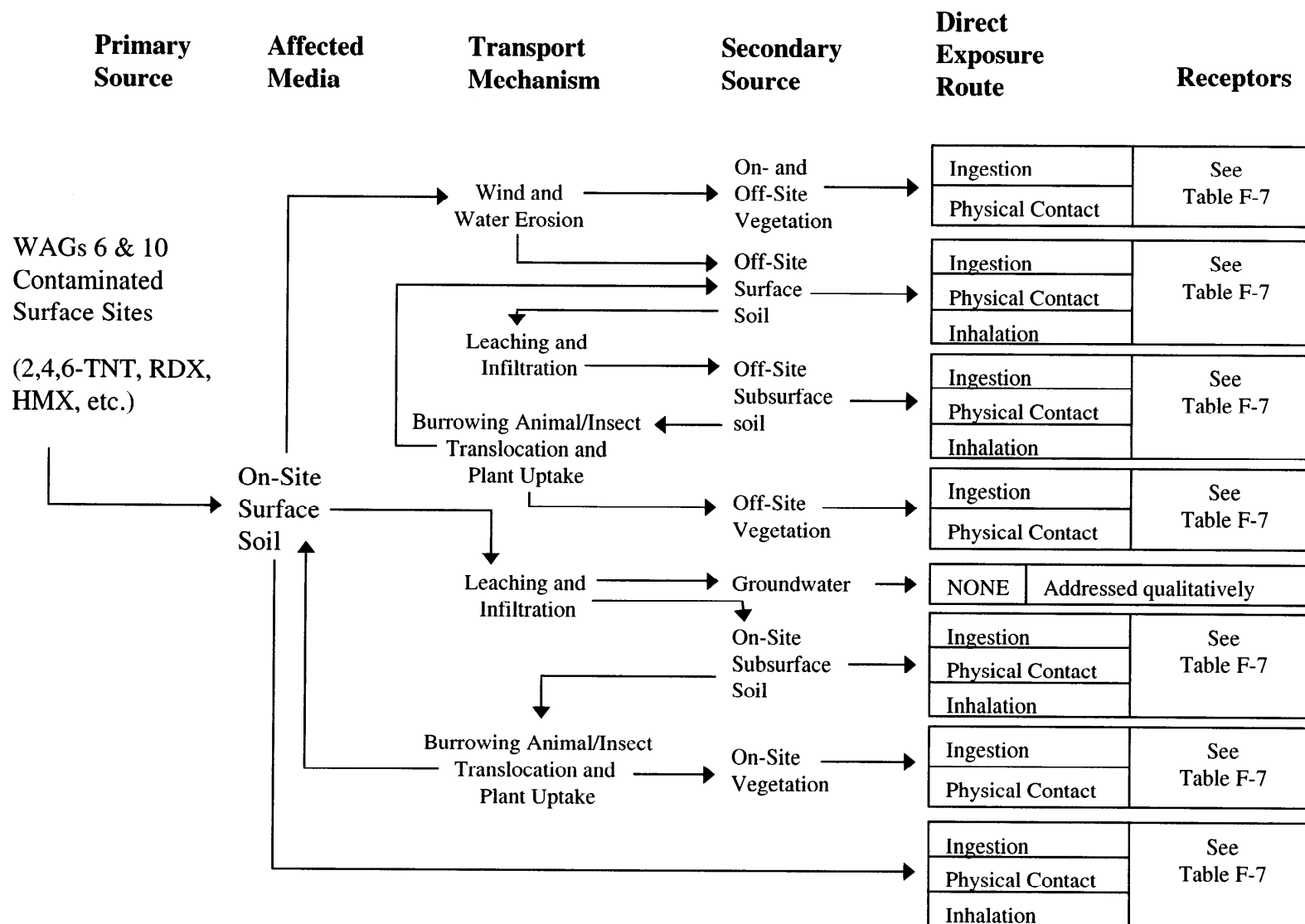


Figure F-3. Model for ecological pathways and exposure for WAGs 6 and 10 surface contamination.

F-3.2.2 Threatened, Endangered, and Other Species of Concern

A list of (a) T/E and (b) sensitive species potentially present at the INEEL was compiled from the U.S. Fish and Wildlife Service (USFWS 1997), the Idaho Department of Fish and Game Conservation Data Center for T/E and sensitive species for the State of Idaho (CDC 1994), and Radiological and Environmental Sciences Laboratory documentation for the INEEL (Reynolds 1994; Reynolds et al. 1986). T/E and sensitive species that may be found on the INEEL are listed in Table F-2. The USFWS no longer maintains a candidate species (C2) listing, but addresses former C2 species as species of concern (USFWS 1996). The C2 designation is retained here to maintain consistency with INEEL ERA assessments conducted before the USFWS change in listing procedures.

No areas of critical habitat, as defined in 40 Code of Federal Regulations 300, are known to exist in the vicinity of WAGs 6 and 10, and no T/E or sensitive plant species have been recorded at or near the facilities.

Avian T/E species or species of concern (formerly C2) with a potential for occurrence in the vicinity of WAGs 6 and 10 sites, include the peregrine falcon (*Falco peregrinus*), bald eagle (*Haliaeetus leucocephalus*), northern goshawk (*Accipiter gentilis*), ferruginous hawk (*Buteo regalis*), loggerhead shrike (*Lanius ludovicianus*), and burrowing owl (*Athene cunicularia*) (USFWS 1997). The bald eagle and peregrine falcon are federally listed species. The remaining avian species are species of concern (formerly C2). Three aquatic species of concern, the trumpeter swan (*Cygnus buccinator*), black tern (*Chelidonias niger*), and white-faced ibis (*Plegadis chihi*) are not likely to occur at WAGs 6 and 10 because of the absence of surface water impoundments. Therefore, these species were not evaluated in the ERA. Four mammalian C2 species could potentially occur at or near WAGs 6 and 10 sites. These include the pygmy rabbit (*Brachylagus idahoensis*), Townsend's western big-eared bat (*Corynorhinus* [= *Plecotus*] *townsendii*), long-eared myotis (*Myotis evotis*), small-footed myotis (*Myotis ciliolabrum* [= *subulatus*]) (USFWS 1997). While the presence of the pygmy rabbit at WAGs 6 and 10 facilities has not been verified, appropriate habitat exists in areas of surrounding WAGs 6 and 10 facilities (Gabler 1997). The occurrence of the gray wolf on the INEEL is unverified. The sagebrush lizard (*Sceloporous graciosus*) is the only reptile species of concern with a potential presence at WAGs 6 and 10.

In 1999, field surveys were conducted in the areas included in WAGs 6 and 10 to assess the presence and use of those areas by T/E species or other species of concern (i.e., species formerly designated as C2). The survey findings have been documented in a report that includes (a) survey protocols, (b) results for WAGs 6 and 10 and other WAGs, and (c) an interpretive summary for the INEEL Site (OU 10-04) (Morris 1998). The specific information collected and reported for each T/E or species of concern includes the following:

- The dates and conditions under which the surveys were conducted
- The area encompassed by the surveys (global positioning system mapping where practical)
- Global positioning system locations for observed habitat, sign, and species sighted (where practicable)
- Habitat description, the proximity to a WAG or site, and an estimate of whether contaminated sites or areas are within the home range of members of the species in question
- Species presence, abundance, current site use, past site use (historical sightings or surveys), and anticipated site use (based on professional judgment)

Table F-2. Threatened or endangered species, sensitive species, and species of concern that may be found on the INEEL.^a

Common Name	Scientific Name	Federal Status ^{b,c}	State Status ^c	BLM Status ^c	USFS ^f Status ^c
<u>Plants</u>					
Lemhi milkvetch	<i>Astragalus aquilonius</i>	—	S	S	S
Painted milkvetch ^e	<i>Astragalus ceramicus</i> var. <i>apus</i>	3c	R	—	—
Plains milkvetch	<i>Astragalus gilviflorus</i>	NL	1	S	S
Winged-seed evening primrose	<i>Camissonia pterosperma</i>	NL	S	S	—
Nipple cactus ^e	<i>Coryphantha missouriensis</i>	NL	R	—	—
Spreading gilia	<i>Ipomopsis (=Gilia) polycladon</i>	NL	2	S	—
King's bladderpod	<i>Lesquerella kingii</i> var. <i>cobrensis</i>	—	M	—	—
Tree-like oxytheca ^e	<i>Oxytheca dendroidea</i>	NL	R	R	—
Inconspicuous phacelia ^d	<i>Phacelia inconspicua</i>	C2	SSC	S	S
Ute ladies' tresses ^d	<i>Spiranthes diluvialis</i>	LT	—	—	—
Puzzling halimolobos	<i>Halimolobos perplexa</i> var. <i>perplexa</i>	—	M	—	S
<u>Birds</u>					
Peregrine falcon	<i>Falco peregrinus</i>	3C	E	—	—
Merlin	<i>Falco columbarius</i>	NL	—	S	—
Gyr falcon	<i>Falco rusticolus</i>	NL	SSC	S	—
Bald eagle	<i>Haliaeetus leucocephalus</i>	LT	T	—	—
Ferruginous hawk	<i>Buteo regalis</i>	C2	SSC	S	—
Black tern	<i>Chlidonias niger</i>	C2	—	—	—
Northern pygmy owl ^d	<i>Glaucidium gnoma</i>	—	SSC	—	—
Burrowing owl	<i>Athene cunicularia</i>	C2	—	S	—
Common loon	<i>Gavia immer</i>	—	SSC	—	—
American white pelican	<i>Pelicanus erythrorhynchos</i>	—	SSC	—	—
Great egret	<i>Casmerodius albus</i>	—	SSC	—	—
White-faced ibis	<i>Plegadis chihi</i>	C2	—	—	—
Long-billed curlew	<i>Numenius americanus</i>	3c	—	S	—
Loggerhead shrike	<i>Lanius ludovicianus</i>	C2	NL	S	—
Northern goshawk	<i>Accipiter gentilis</i>	C2	S	—	S
Swainson's hawk	<i>Buteo swainsoni</i>	—	—	S	—
Trumpeter swan	<i>Cygnus buccinator</i>	C2	SSC	S	S
Sharptailed grouse	<i>Tympanuchus phasianellus</i>	C2	—	S	S
Boreal owl	<i>Aegolius funereus</i>	—	SSC	S	S
Flammulated owl	<i>Otus flammeolus</i>	—	SSC	—	S
<u>Mammals</u>					
Gray wolf ^g	<i>Canis lupus</i>	LE/XN	E	—	—
Pygmy rabbit	<i>Brachylagus (=Sylvilagus) idahoensis</i>	C2	SSC	S	—
Townsend's Western big-eared bat	<i>Corynorhinus (=Plecotus) townsendii</i>	C2	SSC	S	S
Merriam's shrew	<i>Sorex merriami</i>	—	S	—	—
Long-eared myotis	<i>Myotis evotis</i>	C2	—	—	—

Table F-2. (continued).

Common Name	Scientific Name	Federal Status ^{b,c}	State Status ^c	BLM Status ^c	USFS ^f Status ^c
Small-footed myotis	<i>Myotis ciliolabrum</i> (=subulatus)	C2	—	—	—
Western pipistrelle ^d	<i>Pipistrellus hesperus</i>	NL	SSC	—	—
Fringed myotis ^d	<i>Myotis thysanodes</i>	—	SSC	—	—
California myotis ^d	<i>Myotis californicus</i>	—	SSC	—	—
<u>Reptiles and amphibians</u>					
Northern sagebrush lizard	<i>Sceloporus graciosus</i>	C2	—	—	—
Ringneck snake ^d	<i>Diadophis punctatus</i>	C2	SSC	S	—
Night snake ^e	<i>Hypsiglena torquata</i>	—	—	R	—
<u>Insects</u>					
Idaho pointheaded grasshopper ^d	<i>Acrolophitus punchellus</i>	C2	SSC	—	—
<u>Fish</u>					
Shorthead sculpin ^d	<i>Cottus confusus</i>	—	SSC	—	—

a. This list was compiled from a letter from the U.S. Fish and Wildlife Service (USFWS) (1997) for threatened or endangered, and sensitive species listed by the Idaho Department of Fish and Game (IDFG) Conservation Data Center (CDC 1994 and IDFG web site 1997) and Radiological Environmental Sciences Laboratory documentation for the INEEL (Reynolds et al. 1986).

b. The USFWS no longer maintains a candidate (C2) species listing but addresses former listed species as “species of concern” (USFWS 1996). The C2 designation is retained here to maintain consistency between completed and ongoing INEEL ERA assessments.

c. Status codes: INPS=Idaho Native Plant Society; S=sensitive; 2=State Priority 2 (INPS); 3c=no longer considered for listing; M=State of Idaho monitor species (INPS); NL=not listed; 1=State Priority 1 (INPS); LE=listed endangered; E=endangered; T = threatened; XN = experimental population, nonessential; SSC=species of special concern; and C2 = see item b, formerly Category 2 (defined in CDC 1994). BLM=Bureau of Land Management; R = removed from sensitive list (nonagency code added here for clarification).

d. No documented sightings at the INEEL; however, the ranges of these species overlap the INEEL and are included as possibilities to be considered for field surveys.

e. Recent updates that resulted from Idaho State Sensitive Species meetings (BLM, USFWS, INPS, and USFS) - (INPS 1995, 1996, and 1997).

f. U.S. Forest Service (USFS) Region 4.

g. Anecdotal evidence indicates that isolated wolves may occur on the INEEL. However, no information exists to substantiate hunting or breeding on site (Morris 1998).

- An estimated site or area population (where possible).

Surveys for some species also were supported by geographical information system (GIS) analyses using recently developed habitat models.

On June 29 and July 8, 1998, field surveys were conducted for individual sites of concern within WAG 10. The WAG 6 sites of concern were also surveyed on June 29, 1999. The field surveys for WAG 6 and WAG 10 have been evaluated and are included in this ERA (Tables F-3 and F-4). An onsite inspection was conducted, and each site of contamination was evaluated for habitat qualities and the potential to support INEEL T/E species or other species of concern. A suite of site habitat attributes was evaluated for the suitability for each species of interest. The attributes evaluated included the following:

- Size
- Substrate (e.g., gravel, asphalt, and lawn)
- Natural or anthropogenic features that entice wildlife (e.g., water or lights)
- Proximity to areas or sites of facility activity
- Presence and availability of food or prey
- Availability of nesting, roosting, or loafing habitat
- Signs of wildlife use
- Prior history and known sightings or use.

Attributes were subjectively rated for positive contributions to overall habitat suitability. A site rating of high, medium, low, or none was assigned based on the positive habitat features and probability that the species of concern may occupy the site. The conventions upon which ratings were assigned for individual habitat attributes are summarized in Table F-5. Though T/E and sensitive species were of primary consideration, the potential use by big game species and unique populations (spadefoot toad and Merriam's shrew) was also assessed.

Sites for which risk to receptors has been calculated ($HQ > 1$), but no positive habitat attributes were observed are unlikely to contribute to wildlife exposures. Sites rated overall as "low" are those having one or two positive attributes and, therefore, only a potential for incidental use by wildlife. These sites also may be generally discounted as contributing significantly to chronic wildlife contaminant exposures.

The results of the survey and site rating for the WAGs 6 and 10 sites of concern are summarized on Table F-3. The duration and rigor of these surveys were not adequate to verify the presence or frequency of occurrence, but were conducted to allow evaluation of WAGs 6 and 10 sites of concern in an ecological context. The rankings for sites presented here are subjective, based on professional opinion supported by limited observation. In addition, based on the 2000 fire season, this table has been annotated to reflect changes in habitat due to burn.

Table F-3. Summary of biological field survey for WAG 10.

WAG 10 Site:	B. Tern	T. Swan	W.f. Ibis	B. Owl	F. Hawk	P. Falcon	L. Shrike	B. Eagle	Bats	M. Shrew	P. Rabbit	S. b. Lizard	S. toad	Game	Comments
10-01 (LCCDA)				L	L	L						L			Open crested wheatgrass planting, weeds, few shrubs
10-02 (OMRE-1)												M			Area of heavy construction, decontamination and dismantlement (D&D) activity, perching poles, closed fence with crested wheatgrass plantings and scattered rabbitbrush
Fire Training N												H		M	Sagebrush/rabbitbrush and crested wheatgrass plantings, areas of native vegetation. Near road, unfenced, adjacent to major road, adjacent power lines are single poles/w insulator/line on top
Fire Training S															
Experimental Field Station				L	M	M	L		L			M		M	Surrounded by rabbitbrush and primarily crested wheatgrass, good patches of taller sagebrush
Rail Car Detonation					L	L	M		M		M	M		H	Large sagebrush in crater and along river, soil in crater probably compacted, native grass and shrubby rabbitbrush surrounding depression, unfenced, adjacent to Big Lost River, low human activity, sign of antelope
Mass Detonation Area				M	M	M	H		M		M	H	L	H	Large areas of sagebrush/rabbitbrush, canal along N boundary with burrowing activities of larger mammals (badger, etc.), antelope and rabbit sign, observed burrowing owl, fairly removed from activity, area bounded on North by Big Lost River, roosts, raptors, doves, nighthawk sightings
Unexploded ordnance east of TRA				L	M	M	M		M		M	H		H	Good open sagebrush/grass and ground cover, generally native habitat, rabbit and owl pellets
Bunker north of INTEC				L	M	M	M		M		M			M	Concrete rubble pile covered with weedy vegetation and large sagebrush, surrounded by sagebrush/rabbitbrush – recent burrowing of larger mammals beneath concrete, rabbit sign, fairly close to powerlines and poles
Craters East of CPP				M	H	M	M		L			M		L	Depressions in large crested wheatgrass seeding, also cw in craters, bounded on the east by native sagebrush/grass community – bisected by power lines – double w/ cross poles, rodent burrows in and around craters

Table F-3. (continued).

WAG 10 Site:	B. Tern	T. Swan	W.f. Ibis	B. Owl	F. Hawk	P. Falcon	L. Shrike	B. Eagle	Bats	M. Shrew	P. Rabbit	S. b. Lizard	S. toad	Game	Comments
Naval Ordnance Disposal Facility (NODA)				M	H	M	H		H	M	M	M	L	H	North of firing range, area adjacent to section of Big Lost River, much reseeded area, weedy and rabbit brush, scattered sagebrush in remediated areas – Large sagebrush and narrow riparian vegetation along river, snags and juniper nearby
Fuse Burn Area				M	H	H	H		H		H	H		H	Good native sagebrush/grass areas, cultural sites, removed from activity, some crested wheatgrass plantings, rabbit and coyote sign
Radioactive Waste Management Complex (RWMC) test area				L	M	M	H		M	M	H	H	M	H	South of Big Lost River reststop along Highway 20, metal fragments, no contamination associated, good sagebrush habitat – but cheatgrass in interspaces, in close proximity to Big Lost River, rodent activity, many raptors, nighthawks, flickers, etc.
Juniper Mine					H	L	M	L	H		M	M		H	No pathway to receptors, good juniper habitat
Powerline				M	H	M	L	L	M		M	H		H	Inert projectiles, no contaminants – generally crested wheatgrass seedings
Naval Ordnance Test Facility (NOTF)				M	M	M	H		M		H	H		M	Along railroad tracks east of RWMC, Loggerhead shrike observed, good sagebrush habitat, patches of larger, dense plants adjacent, also areas of thistle, rabbitbrush, and weeds around structures and berm w/ concrete wall on N side
Land Farm									M						Cultivated bioremediation project – weeds, open, near active areas, manure mulch, facilities/substation for roosting, night lighting in vicinity
CFA-66									L		L				Highly disturbed area covered with asphalt. Human activity prevalent in the surrounding area.

H = high
M = medium
L = low

LCCDA = Liquid Corrosive Chemical Disposal Area
OMRE = Organic-Moderated Reactor Experiment
TRA = Test Reactor Area

INTEC = Idaho Nuclear Technology and Engineering Center
CPP = Chemical Processing Plant
CFA = Central Facilities Area

Table F-4. Summary of biological field survey for WAG 6.

WAG 6 Sites:	B. Tern	T. Swan	W.f. Ibis	B. Owl	F. Hawk	P. Falcon	L. Shrike	B. Eagle	Bats	M. Shrew	P. Rabbit	S. b. Lizard	S. toad	Game	Comments
WAG 6 complex				M	L	M	M		M		M	H		M	General area includes two fenced sites, one w/biobarrier, one with concrete slab surrounded by bareground/weeds. Fences allow for perching/hunting in general area. Area is in close proximity to the main road to RWMC.
Reactor Bld															
Burial area															
Misc. sites dump, etc.															
H = high M= medium L= low															

Table F-5. Habitat rating conventions for WAG 6 and 10 sites of concern.

Attribute	Examples
Size	Areas having physical dimensions too small to support species of interest were rated “none” unless enhanced by other attributes. Large, unconfined areas adequate to support wildlife were assigned higher ratings.
Substrate	Asphalt = none, gravel = low, lawn, soil = medium-high for some species, disturbed vegetation community = medium to high, natural vegetation community = high.
Natural or anthropogenic features	Water = high (water [permanent or ephemeral] is an important component in desert systems); lights = medium (both attract insects and consequently bats and insectivorous birds [i.e., swallows, nighthawks])
Proximity to areas of activity	Proximity to areas or sites of moderate or heavy activity may reduce desirability. Sites associated with buildings and facilities may be more suitable if abandoned or little used (i.e., bat roosts).
Nesting, roosting, or loafing habitat	Structures such as fence and power poles adjacent to open fields afford perches for, for example, roosting and hunting.
Signs of wildlife use	Signs of wildlife use that qualitatively feed the evaluation. Examples of these signs include observation of animals, tracks, hair, or scat.
Prior history	Documented or reported sightings.

F-3.3 Stressor Identification and Characterization

Guidance from the U.S. Department of Energy (DOE) (1993) defines a stressor as “any physical, chemical, or biological entity that can induce adverse response.” Of primary concern for the Comprehensive Environmental Response, Compensation, and Liability Act are the effects of chemical stressors. At WAGs 6 and 10 sites, chemical stressors include a variety of radionuclides, organics, and metals detected in surface and subsurface soils at multiple sites. In this section, COPCs and sites of concern are screened to determine which sites and contaminants have the potential to cause adverse effects to ecological receptors at WAGs 6 and 10. These sites and contaminants are retained for further analysis in the subsequent phases of the WAGs 6 and 10 ERA.

F-3.3.1 Preliminary Summary of Sites and Data

Sites and contaminants to be considered in the WAGs 6 and 10 ERA were initially identified by the WAGs 6 and 10 ecological site screening and data gap identification (DOE-ID 1999). Sites of concern identified in the initial analysis were reviewed and evaluated for inclusion in the WAGs 6 and 10 ERA (see Table 2-1 of the work plan). The following sites were initially retained for analysis in the WAGs 6 and 10 ERA:

BORAX-01	EBR-09	OMRE-01
BORAX-02	EBR-10	OU 10-03 and 10-05 Ordnance Areas
BORAX-08	EBR-11	STF-02
BORAX-09	EBR-12	OU 10-07 Telecommunications Cable
EBR-01	EBR-15	
EBR-03	Fly Ash Pit (CPP -66)	
EBR-04	LCCDA-01	
EBR-08	LCCDA-02	

NOTE: Three additional sites to be evaluated for ecological risk, as listed in the workplan, are as follows: Experimental Organic-Cooled Reactor (EOCR)-03, Security Training Facility (STF)-01, and 10-06 Radionuclide-Contaminated Soils. EOCR-03 was an oxidation pond that was never used for its designated purpose. The concrete pipe located in the pond was analyzed for asbestos, and no contamination was found. It would be unlikely for this site to pose any significant risk to ecological receptors (see Section 3.3.1). STF-01 has undergone decontamination and decommissioning (D&D), since becoming a new site, and all the contaminated water and material from this site was disposed (completed in 2000). This site would no longer pose any significant risk to ecological receptors (see Section 3.3.5). OU 10-06 was never designated as an OU as discussed in Section 3. Sites identified by OU 10-06 were BORAX and EBR-I windblown areas. In the risk assessment, following the characterization of these areas, it was determined that it would be unlikely that exposure to the COPCs at these areas would cause adverse effects to human populations or exposed ecological receptors (see Section 3.3.7).

F-3.3.2 Exposure-Point Concentration Data

Data from the various human health risk assessments at the sites are solely available for the ERA. As discussed in Section F-3.9.1, concentration data were divided into 0 to 0.15 m (0 to 0.5 ft), 0 to 1.22 m (0 to 4 ft), and 0 to 3 m (0 to 10 ft) average concentrations. The 0 to 0.15-m (0 to 0.5-ft) concentrations

were used to characterize surface soil concentrations for the WAGs 6 and 10 ERA. The subsurface concentrations, considered to be 15 cm to 3 m (0.5 to 10 ft), are based on the 15-cm to 3-m (0.5 to 10-ft) concentrations. When only 0 to 3-m (0 to 10-ft) concentrations were available for a site, these concentrations also were used to characterize 0 to 15-cm (0 to 0.5-ft) concentrations.

F-3.3.3 Screening of Sites and Contaminants

This section provides a screening of the sites and contaminants identified in Table F-6 against both background concentrations and EBSLs. In Table F-6, exposure point concentrations (EPCs) are compared to the soil EBSLs and background values for radionuclides, organics, and inorganics, respectively.

The background concentrations were the 95%/95% upper tolerance limit (UTL) for composite samples obtained from INEEL background guidance (Rood et al. 1995). EBSLs were calculated specifically for the INEEL as discussed in INEEL ERA guidance (VanHorn et al. 1995). EBSLs are defined as concentrations of contaminants in soil (or other media) that are not expected to produce any adverse effects to selected ecological receptors under chronic exposure conditions. The development of EBSLs is summarized in the workplan (Appendix D2).

The decision process for inclusion of a site and contaminant combination in a WAG ERA includes the following steps:

1. If the site concentration of the contaminant does not exceed the 95/95% UTL of the background concentrations for composite samples (Rood et al. 1995), and if the contaminant concentration at the site does not exceed the minimum EBSL concentration, then the contaminant is not considered in the WAG ERA for that site.
2. As with the human health risk assessment, it is appropriate to screen six inorganic constituents that are not associated with toxicity under normal circumstances. These include aluminum, calcium, magnesium, potassium, iron, and sodium. These will be eliminated if concentration is less than 10 times the INEEL background concentration.

F-3.3.4 Summary of Sites and COPCs Retained for Further Assessment

The EBSL and background screening process (see Table F-6) resulted in the elimination of all radionuclide contaminants at all sites. BORAX-02, BORAX-08, several ordnance sites, and all of the EBR sites except EBR-01 were completely eliminated from the assessment. The following 17 sites were retained for further assessment in the subsequent phases of the WAGs 6 and 10 ERA. For detailed site descriptions, see Section F-3.9.3.

- BORAX-01
- BORAX-09
- Fly Ash Pit (CPP-66)
- LCCDA-01
- LCCDA-02
- CFA-633 Naval Firing Site and Downrange Area
- Naval Ordnance Disposal Area (NODA)
- National Oceanic and Atmospheric Administration (NOAA) Grid
- Fire Station II Zone and Range Fire Burn Area
- Mass Detonation Area
- Experimental Field Station
- Unexploded Ordnance east of the TRA
- Burn Ring south of Experimental Field Station
- Rail Car Explosion Area
- Land Mine and Fuze Burn Area
- Craters east of INTEC
- STF-02

Table F-6. Summary of WAGs 6 & 10 ERA results.^a

Operable Unit	Site	Description	Ecological Risk Assessment Results
WAG 6			
6-02	BORAX-01	Boiling Water Reactor Experiment (BORAX) II through V Leach Pond	Contaminates of potential concern (COPCs) for this site are found in subsurface soil (depth 6.5–9.5 ft). Hazard quotients (HQs) exceed 1.0 for terrestrial receptors exposure to cadmium (HQs ranged from 1–800), cobalt (HQs ranged from 1–8), and mercury (HQs ranged from 1–2). Cadmium also has HQs that exceed 1.0 for a few avian receptors. 2,4 dichlorophenol and chloromethane were among these COPCs, but no toxicity information could be found to assess ecological risk. The concentrations of these compounds were at very low levels, 0.068 mg/kg for 2,4 dichlorophenol, and 0.002 mg/kg for chloromethane. COPCs at this site were eliminated because most of the HQs were below 10, which indicates a low risk to ecological receptors. However, HQs for cadmium were as high as 800. The EPC for cadmium represents an overly conservative value assumed to be present throughout the soil interval due to exposure modeling using volume weighted averages. In reality, the concentration at this depth is not likely to pose a significant ecological risk to any ecological receptors because of shallow burrowing depths and lack of bioaccumulation potential. For this reason, cadmium was not retained as a COPC, and this site was eliminated as a concern for ecological receptors.
6-01	BORAX-02	BORAX I Burial Site	The site was eliminated in the ecologic based screening level (soil contaminant screening process). See Appendix C.
6-02	BORAX-08	BORAX V Ditch	The site was eliminated in the soil contaminant screening process. See Appendix C.
6-02	BORAX-09	BORAX II through V Reactor Building	The COPCs are manganese and mercury for surface and subsurface soil HQs exceed 1.0 for terrestrial receptors exposure to manganese (HQs ranged from 1–10) and mercury (HQs ranged from 1–6). Mercury also has HQs that exceed 1.0 for a few avian receptors. Manganese and mercury were eliminated from this site because their HQs were equal to or below 10, which indicates low risk to ecological receptors.
None	EBR-01	Experimental Breeder Reactor (EBR)-I Reactor Building	Historical site. Site will be addressed in a facility-wide risk assessment. See Section 7.
None	EBR-03	EBR-I Seepage Pit (WMO-702)	The site was eliminated in the soil contaminant screening process. See Section 6.
None	EBR-04	EBR-I Septic Tank (WMO-701)	The site was eliminated in the soil contaminant screening process. See Appendix C.
6-03	EBR-08	EBR-I (WMO-703) Fuel Oil Tank	The COPCs are TPH-diesel and xylene for subsurface soil (depth of 18 ft). The five biased soil samples used in this ecological risk assessment were collected from the base of the excavation. The excavation was backfilled with clean soil. This site was eliminated as a concern because there is no significant pathway to ecological receptors.
6-03	EBR-09	EBR-I (WMO-704) Fuel Oil Tank at WMO-601	TPH-diesel is the COPC in subsurface soil. This COPC was eliminated as a concern because there is no significant pathway to ecological receptors.
6-03	EBR-10	EBR-I (WMO-705) Gasoline Tank	COPCs for this site are TPH-diesel and xylene found in the subsurface soil (depth 9.5–12 ft). The five biased soil samples used in this ERA were collected from the base of the excavation (9.5 ft). The excavation was backfilled with clean soil. The concentration at this depth is not likely to pose a significant ecological risk to any ecological receptors because it is a small area with limited ecological habitat, and there is no significant pathway to ecological receptors.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
6-03	EBR-11	EBR-I Fuel Oil Tank (EBR-706)	TPH-diesel is the COPC in subsurface soil (depth 8–10 ft). This site was eliminated as a concern because there is no significant pathway to ecological receptors.
6-03	EBR-12	EBR-I Diesel Tank (EBR-707)	TPH-diesel is the COPC in subsurface soil (depth 9 ft). This site was eliminated as a concern because there is no significant pathway to ecological receptors.
6-04	EBR-15	Radionuclide Soil Contamination (EBR-1)	The site was eliminated in the soil contaminant screening process. See Appendix C.
WAG 10			
	CPP-66	Fly Ash Pit	COPCs for this site are found in surface soils. HQs exceed 1.0 for terrestrial receptors exposures to boron (HQs ranged from 1–100), copper (HQs ranged from 1–8) and strontium (HQs ranged from 1–10). HQs for selenium were, 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to this COPC. Copper and strontium were eliminated as contaminants from this site because all HQs were below or equal to 10, which indicate a low risk to ecological receptors. All species except for plants have HQs that fall below the low risk HQ of 10 for boron. The plants were modeled with a conservative plant uptake factor (PUF) of 1.0 because a more realistic PUF has not yet been determined. It is not anticipated that this exposure will occur. The use of a more realistic PUF would likely reduce the HQs for these receptors. For this reason, it would be unlikely for boron to pose significant risk to plant receptors and it will no longer be evaluated as a COPC.
10-01	LCCDA-01	Liquid Corrosive Chemical Disposal Area (LCCDA) Old Disposal Pit (west end)	COPCs for this site are found in various subsurface soil depths (0–3 ft to 9–11 ft). HQs exceed 1.0 for terrestrial receptors exposed to barium (HQs ranged from 1–5), cobalt (HQs ranged from 1–4), copper (HQs ≤ 1), and manganese (HQs ranged from 1–10). HQs for beryllium and vanadium are < 1 for all receptors; therefore, the risk to terrestrial receptors (or avian receptors for vanadium) is unlikely and these COPCs, can be eliminated. 1,1,2-trichloroethane was among these COPCs, but no toxicity information could be found to assess ecological risk. This compound was considered a low risk because its maximum concentration was 0.009 mg/kg and it is highly volatile. All COPCs at this site were eliminated because all HQs were below or equal to 10, which indicates low risk to ecological receptors.
10-01	LCCDA-02	LCCDA Limestone Treatment and Disposal Pit (east end)	COPCs for this site are found in various subsurface soil depths (5–7 ft to 8–10 ft). HQs exceed 1.0 for terrestrial receptors exposures to copper (HQs ≤ 1) and manganese (HQs ranged from 1–6). HQs for beryllium are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to beryllium. 1,1,2- Trichloroethane was among these COPCs, but no toxicity information could be found to assess ecological risk. This compound was considered a low risk because its maximum concentration was 0.008 mg/kg and it is volatile. All COPCs at this site were eliminated because all HQs were below 10, which indicates a low risk to ecological receptors.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
10-02	OMRE-01	Organic-Moderated Reactor Experiment (OMRE) Leach Pond	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposures to chrysene (HQs ranged from 1–200). HQs for lead and selenium were 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to these COPCs. Methacrylonitrile was among these COPCs, but no toxicity information could be found to assess ecological risk. This compound was considered a low risk because its maximum concentration was 0.0037 mg/kg and it is volatile. HQs for chrysene were well above 10. However, the two maximum chrysene concentrations used to help determine the EPCs were associated with degraded asphalt, giving an unrealistically elevated concentration for this compound (see discussion in Section 2.2 of Appendix J). Significant risk from this COPC is not expected to occur and it will no longer be evaluated.
10-03		Arco High Altitude Bombing Range	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1 in Section 21 of the RI/FS.
10-03		Naval Ordnance Test Facility (NOTF)	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		CFA-633 Naval Firing Site and Downrange Area	COPCs for this site are found in surface soil. HQs exceed 1.0 for terrestrial receptors exposed to 2,4,6-trinitrotoluene (2,4,6-TNT) (HQs ranged from 1–2), HMX (HQs ranged from 1–4), and RDX (HQs ranged from 1–70). HQs for 1,3,5-trinitrobenzene are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to 1,3,5-trinitrobenzene. TNT and HMX were eliminated from this site because the HQs fell below 10, which indicates a low risk to ecological receptors. However, HQs for RDX ranged from 1 to 70. Four sample results for RDX were considered “hot spots” and were removed from the data set before the EPCs were calculated. The remaining areas or “hot spots” are limited (approximately 201 in. sq) and results in significantly less exposure than modeled. However, there is a potential for risk to terrestrial receptors exposed to RDX.
10-03		CFA Gravel Pit	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		CFA Sanitary Landfill Area	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
10-03		Naval Ordnance Disposal Area (NODA)	<p>COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to 1,3-dinitrobenzene (HQs ranged from 1–2), barium (HQs ranged from 1–70), cadmium (HQs ranged from 1–500), chromium (HQs ranged from 1–5), cobalt (HQs ranged from 1–50), copper (HQs ranged from 1–30), lead (HQs ranged from 1–5), manganese (HQs ranged from 1–10), mercury (HQs ranged from 1–8), nitrite (HQs ranged from 1–3), nitrate (HQs ≤ 1) pentachlorophenol (HQs ranged from 1–3), RDX (HQs ranged from 1–4,000), strontium (HQs ranged from 1–4), vanadium (HQs ranged from 1–10), and zinc (HQs ranged from 1–10). Also, cadmium, cobalt, copper, lead, mercury, nitrate, and zinc have HQs that exceed 1.0 for a few avian receptors. HQs for 1,3,5-trinitrobenzene, 2-amino-4,6-dinitrotoluene, 2,4,6-TNT, 2-methylnaphthalene, 4-amino-2,6-dinitrotoluene, 4-methyl-2-pentanone, antimony, benzo(g,h,i)perylene, HMX, nickel, silver, and tetra were < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors (or avian receptors for nickel and silver) from exposure to these COPCs. Several explosive and organic contaminants were among these COPCs, but no toxicity information could be found to assess ecological risk. These compounds were considered low risk because their concentrations were found at very low levels; 0.0054 mg/kg (2-hexanone), 51 mg/kg (2-pentanone), 1 mg/kg (4-nitrophenol), 0.006 mg/kg (chlorobenzene), 0.428 mg/kg (picric acid), 1,3-dinitrobenzene, chromium, lead, manganese, mercury, nitrate, nitrite, pentachlorophenol, strontium, vanadium and zinc were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for barium, cadmium, cobalt, copper, and RDX were all above 10. Barium, cadmium, and cobalt were eliminated as a COPC because of the conservative values used during the risk assessment. These contaminants would not be likely to pose any significant risk if more realistic values were used. There is a potential for risk to terrestrial receptors exposed to copper and RDX.</p>
		Area 2	
		Area 3	

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
		Area 4	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to manganese (HQs ranged from 1–20), and TPH-diesel (HQs ranged from 1–80). HQs for chrysene and selenium were < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors (or avian receptors for selenium) from exposure to these COPCs. Methapyrilene was among these COPCs, but no toxicity information could be found to assess ecological risk. This compound was considered low risk because its concentration was found at very low levels, 1.7 mg/kg. HQs for manganese, sulfate, and TPH-diesel were all above 10. Manganese was eliminated as a COPC because of the conservative values used during the risk assessment. This contaminant would not be likely to pose any significant risk if more realistic values were used. There is a potential for risk to terrestrial receptors exposed to TPH-diesel.
10-03		Explosive Storage Bunkers North of INTEC	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		National Oceanic and Atmospheric Administration (NOAA) Grid	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–5), and nitrite (HQ equaled 1). Also nitrate and nitrite have HQs that exceed 1.0 for a few avian receptors. Nitrate and nitrite were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
		Area 1	
		Area 2	COPCs for this site are found in surface soil. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–5) and nitrite (HQs ranged from 1–2). Also nitrate and nitrite have HQs that exceed 1.0 for a few avian receptors. HQs for 1,3,5-trinitrobenzene 2,4,6-TNT and 4-amino-2,6-dinitrotoluene are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to these COPCs. COPCs at this site were eliminated because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
		Area 2a	The COPCs include 1,3,5-trinitrobenzene, 2,4,6-TNT and RDX found in surface soils. HQs exceed 1.0 for terrestrial receptors exposed to 2,4,6-TNT (HQs ranged from 1–200) and RDX (HQs ranged from 1–10). HQs for 1,3,5-trinitrobenzene are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to 1,3,5-Trinitrobenzene. RDX was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for 2,4,6-TNT were as high as 200. There is a potential for risk to terrestrial receptors exposed to TNT.
		Area 3	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to 2,4,6-TNT (HQs ranged from 1–100), nitrate (HQs ranged from 1–5) and RDX (HQs ranged from 1–20). Also, nitrate has HQs that exceed 1.0 for a few avian receptors. HQs for nitrite are < 1 for all receptors; therefore, there is no expected risk to terrestrial and avian receptors from exposure to nitrite. Nitrate was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for 2,4,6-TNT and RDX were well above 10.
		Area 4	The COPC in this area is found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–3). Also, nitrate has HQs that exceed 1.0 for a few avian receptors. Nitrate was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
		Area 5	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to 1,3,5-trinitrobenzene (HQs ranged from 1–2), 2,4,6-TNT (HQs ranged from 1–500), and nitrate (HQs ranged from 1–3). Also, nitrate has HQs that exceed 1.0 for a few avian receptors. HQs for 2-amino-4,6-dinitrotoluene are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to this COPC. 1,3,5-trinitrobenzene and nitrate were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for 2,4,6-TNT were well above 10. There is a potential for risk to terrestrial receptors exposed to 2,4,6-TNT.
		Area 6	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposures to 1,3-dinitrobenzene (HQs ranged from 1–200), TNT (HQs ranged from 1–100), nitrate (HQs ranged from 1–2). Also, nitrate has HQs that exceed 1.0 for a few avian receptors. HQs for 1,3,5-trinitrobenzene, 2-amino-4,6-dinitrotoluene, and 4-amino-2,6-dinitrotoluene are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to these contaminants. Nitrate was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for 1,3-dinitrobenzene and 2,4,6-TNT were well above 10. There is a potential for risk to terrestrial receptors exposed to 1,3-dinitrobenzene and 2,4,6-TNT.
10-03		Twin Buttes Bombing Range	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Fire Station II Zone and Range Fire Burn Area	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to 2,4,6-TNT (HQs ranged from 1–20), nitrate (HQs ranged from 1–5), and RDX (HQs ranged from 1–9). Also, nitrate has HQs that exceed 1.0 for a few avian receptors. Nitrate and RDX were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for 2,4,6-TNT, were all above 10. There is a potential for risk to terrestrial receptors exposed to 2,4,6-TNT.
		Area 1	
		Area 2	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposures to 2,4,6-TNT (HQs ranged from 1–4), nitrate (HQs ranged from 1–4), nitrite (HQs ≤ 1), and RDX (HQs ranged from 1–40). Also, nitrate and nitrite have HQs that exceed 1.0 for a few avian receptors. HQs for 4-amino-2,6-dinitrotoluene and HMX are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to these contaminants. 2,4,6-TNT, nitrate, and nitrite were eliminated from this site because the HQs were below or equal to 10, which indicate a low risk to ecological receptors. However, HQs for RDX were all above 10. There is a potential for risk to terrestrial receptors exposed to RDX.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
		Area 3	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to copper (HQs ranged from 1–3), and TPH-diesel (HQs ranged from 1–8). HQs for chrysene, lead, nitrite, selenium, and xylene were < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors (or avian receptor for lead, nitrite, and selenium); and these COPCs can be eliminated. Trichlorofluoromethane was among the COPCs, but no toxicity information could be found to assess ecological risk. This compound was considered low risk because its concentration was found at very low levels, 0.012 mg/kg, and it is a volatile compound not likely to persist in the soil. Copper and TPH-diesel were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
		Area 4	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to 2,4,6-TNT (HQs ranged from 1–40), and nitrate (HQs ≤ 1). HQs for nitrite are < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to nitrite. Nitrate was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for TNT were all above 10. There is a potential for risk to terrestrial receptors exposed to TNT.
10-03		Anaconda Power Line	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Old Military Structures	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Mass Detonation Area	COPCs for this site are found in surface and subsurface soils. HQs for 2,4-dinitrotoluene and nitrite were < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors (or avian receptors for nitrite) from exposure to these COPCs.
10-03		Dairy Farm Revetments	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Experimental Field Station	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to 1,3,5-trinitrobenzene (HQs ranged from 1–2), 1,3-dinitrobenzene (HQs ranged from 1–80), 2,4,6-TNT (HQs ranged from 1–300), and nitrate (HQs ranged from 1–3). HQs for 4-amino-2,6-dinitrotoluene and nitrite were < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to these contaminants. This compound was considered low risk because its concentration was found at very low levels, 8 mg/kg. Nitrate was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for 1,3-dinitrobenzene and 2,4,6-TNT were well above 10. There is a potential for risk to terrestrial receptors exposed to 1,3-dinitrobenzene and 2,4,6-TNT.
		Area 1	
		Area 2	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–4) and nitrite (HQs ≤ 1). Also, these COPCs have HQs that exceed 1.0 for a few avian receptors. Nitrate and nitrite were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
10-03		Unexploded Ordnance East of the TRA	COPCs for this site are found in surface soils. HQs exceed 1.0 for terrestrial receptors exposed to 2,4,6-TNT (HQs ≤ 1), nitrate (HQs ranged from 1–3), and nitrite (HQs ≤ 1). Also, nitrate and nitrite have HQs that exceed 1.0 for a few avian receptors. 2,4,6-TNT, nitrate, and nitrite were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
10-03		Burn Ring South of Experimental Field Station	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to chromium (HQs ranged from 1–7), cobalt (HQs ranged from 1–5), copper (HQs ranged from 1–3), nitrate (HQs ≤ 1), and zinc (HQs ranged from 1–80). HQs for lead, nickel, and nitrite are < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to these COPCs. Bromomethane and trichlorofluoromethane were among these COPCs, but no toxicity information could be found to assess ecological risk. These compounds were considered low risk because their concentrations were found at very low levels, 0.012 mg/kg for bromomethane, and 0.0059 mg/kg for trichlorofluoromethane. Both of these COPCs are volatile compounds and not likely to persist in soil. Chromium, cobalt, copper, and nitrate were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for zinc were well above 10. There is a potential for risk to terrestrial receptors exposed to zinc.
10-03		Igloo-Type Structures Northwest of Experimental Field Station	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Rail Car Explosion Area Area 2	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–4) and thallium (HQs ranged from 1–3). Also, nitrate and thallium have HQs that exceed 1.0 for a few avian receptors. HQs for nickel, nitrite, and selenium are < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to these COPCs. Nitrate and thallium were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
		Area 3	COPCs for this site are found in surface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–5). Also, nitrate has HQs that exceed 1.0 for a few avian receptors. HQs for nitrite are < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to nitrite. Nitrate was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
		Area 4	COPCs for this site are found in surface and subsurface soils. HQs for 2,6-dinitrotoluene are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to 2,6-dinitrotoluene. Therefore, it would be unlikely for this contaminant to pose any significant risk.
		Area 5	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–3). Also, nitrate has HQs that exceed 1.0 for a few avian receptors. HQs for nitrite are < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to nitrite. Nitrate was eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. Therefore, it would be unlikely for these contaminants to pose any significant risk.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
		Area 6	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–4) and nitrite (HQs ranged from 1–2). Also, nitrate and nitrite have HQs that exceed 1.0 for a few avian receptors. Nitrate and nitrite were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
10-03		Unexploded Projectiles East of ARVFS	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Juniper Mine	Contamination is below 10 feet. No pathway to ecological receptors.
10-03		Projectiles Found Near Mile Marker 17, 18, and 19	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Rifle Range	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Land Mine Fuze Burn Area	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to lead (HQs ranged from 1-2), nitrate (HQs ranged from 1–3), and selenium (HQs ranged from 1-2). Also, lead, nitrate, and selenium have HQs that exceed 1.0 for a few avian receptors. HQs for 2,4,6-TNT and 2,6-dinitrotoluene are < 1 for all receptors; therefore, there is no expected risk to terrestrial receptors from exposure to these COPCs. Lead, nitrate, and selenium were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors.
		Area 3	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to 1,3-dinitrobenzene (HQs ranged from 1–4,000), 2,4,6-TNT (HQs ranged from 1–10,000), 2,4-dinitrotoluene (HQs ranged from 1–200), nitrate (HQs ranged from 1–5), TPH-diesel (HQs ranged from 1–5), and zinc (HQs ranged from 1–10). Nitrate, TPH-diesel, and zinc were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for 1,3-dinitrobenzene, 2,4,6-TNT, and 2,4-dinitrotoluene were well above 10. The potential for risk applies to terrestrial receptors exposed to 1,3-dinitrobenzene, 2,4,6-TNT, and 2,4-dinitrotoluene.
10-03		Ordnance and Dry Explosives East of the Big Lost River and North of the NRF	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Zone East of the Big Lost River	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Dirt Mounds Near the Experimental Field Stations, NOAA, and NRF	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.
10-03		Craters East of INTEC	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposed to nitrate (HQs ranged from 1–4), nitrite (HQs ≤ 1) and selenium (HQs ranged from 1–2). Also, nitrate, nitrite, and selenium have HQs that exceed 1.0 for a few avian receptors. All COPCs at this site were eliminated because all HQs were below or equal to 10, which indicates a low risk to ecological receptors.
10-03		Big Southern Butte	No soil contamination evident. The risk from unexploded ordnance to ecological receptors is considered low. See Table 21-1.

Table F-6. (continued).

Operable Unit	Site	Description	Ecological Risk Assessment Results
10-04	STF-02	STF Gun Range Berm	COPCs for this site are found in surface and subsurface soils. HQs exceed 1.0 for terrestrial receptors exposures to antimony (HQs ranged from 1–4), copper (HQs ranged from 1–10), lead (HQs ranged from 1–2,000), and zinc (HQs ranged from 1–8). HQs for selenium are < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to selenium. Antimony, copper, and zinc were eliminated from this site because the HQs were below or equal to 10, which indicates a low risk to ecological receptors. However, HQs for lead were above 10. The potential for risk applies to terrestrial receptors exposed to lead.
		STF Kickout Area	COPCs for this site are found in surface soils. HQs exceed 1.0 for terrestrial receptors exposed to copper (HQs ranged from 1–6) lead (HQs ranged from 1–2), and manganese (HQs ranged from 1–20). HQs for selenium are < 1 for all receptors; therefore, there is no expected risk to terrestrial or avian receptors from exposure to selenium. All COPCs were eliminated from this site because the HQs were below 10, which indicates a low risk to ecological receptors; except for manganese and no significant risk is expected to occur from exposure to this contaminant (see bulleted discussion below on this COPC).
10-05	None	Ordinance Interim Action	The sites that fall under this OU were addressed under OU 10-03.

a. Sites shown in bold are those with a potential for risk to ecological receptors.